

## REMARKS

Claims 1-8 and 10-13 are pending in this application. Claims 1 through 8 have been amended to more clearly define and distinctively claim the invention. Claim 3 has been cancelled.

### Claims 1-8 and 10-12 are Rejected Under 35 U.S.C. §112

Claims 1-8 and 10-12 are rejected under 35 U.S.C. §112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP §2172.01. The Examiner stated that:

The omitted elements are: Independent claims 1 and 8 fail to provide end reflecting elements (such as mirrors) to properly conform the laser cavity. Furthermore, claim 8 recites a ribbon surrounded by an n-doped layer, but the claim fails to recite any other of the essential structural elements as shown in figures 1, 2, 4, and 5. The claim recites only an active ribbon forming part of a buried mesa with an example “i.e.” recited in the claim. The claim fails to provide any laser limitations in order to configure a laser of the invention. The claims are apparent literal translations from the foreign application with the terms couched in such a way that the claims are vague and indefinite.

Section 2172.01 of MPEP states “[a] claim which omits matter disclosed to be essential to the invention as described in the specification or in other statements of record may be rejected under 35, U.S.C. 112, first paragraph”. (Emphasis Added). In addition, this section states that “a claim which fails to interrelated essential elements of the invention as defined by applicant(s) in the specification may be rejected under 35 U.S.C. 112, second paragraph”. (Emphasis Added).

Claims 1 and 8 have been amended to clarify the interrelated essential elements of these two claims. Applicant respectfully submits that the amended Claims 1 and 8 meet the

requirements of “as described in the specification” and “as defined by applicant(s)” under MPEP §2172.01.

As for providing “end reflecting elements (such as mirrors)”, this invention claims the process and structure of a semiconductor laser. The end reflecting elements are not typically described or claimed in such inventions. For example, in the prior art reference of Scifres et al. (USPN 4,347,611), the Scifres et al. reference also does not describe or claim end reflecting elements such as mirrors.

Claims 8 and 10-12 are Rejected Under 35 U.S.C. §112

Claims 8 and 10-12 are rejected under 35 U.S.C. §112, second paragraph, as being incomplete for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner stated that “[r]egarding claim 8, the phrase “i.e.” renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP §2173.05(d).

Claim 8 has been amended to remove the phrase “i.e.” and more particularly point out and distinctively claim the subject matter.

Claims 1-8 and 10-13 are Rejected Under 35 U.S.C. §103

Claims 1-8 and 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scifres et al ‘611. The Examiner stated that

With respect to claims 1-8 and 10-13, Scifres teaches III-V material substrate (25); forming a thin n-doped layer (16); forming an active layer (18); locally etching the active layer, the thin n-doped layer, and a portion of the thickness of the p-doped confinement layer to form a mesa including the ribbon (figure 1); and burying the ribbon in an n-doped burying layer (16) so that all lateral faces of the ribbon are adjacent only an n-doped layer, the lateral faces including a top face, a

bottom face, and two side faces joined to the top and bottom faces (figure 1). Claim 1 requires forming a p-doped confinement layer on top of the III-V substrate. Scifres teaches an n-doped confinement layer (14). At the time of the invention, it would have been obvious to one having ordinary skill in the art to provide the laser of Scifres with a p-doped, rather than an n-doped, confinement layer. The motivation for doing so would have been to provide a material with desired properties (such as one with a specific refractive index) in order to obtain optimal performance from the laser.

Claim 1 has been amended to recite a method of fabricating a structure, said method comprising:

providing a III-V material (3-1);

(b) forming a p-doped confinement layer (16) overlaying the III-V material substrate;

(c) forming a thin n-doped layer (17) ~~on top of~~ overlaying said p-doped confinement layer;

(d) grown an active layer (4) overlaying said p-doped confinement layer;

(e) forming a thin n-doped layer overlaying the active layer;

(f) locally etching said active layer, said thin n-doped layer and said p-doped confinement layer to form a rectangular-shaped mesa (11), the rectangular-shaped mesa having a ribbon, the ribbon referring to the active layer after etching; and

(g) burying said rectangular-shaped mesa in an n-doped burying layer (19), the rectangular-shaped mesa having a first lateral (top) surface, a second lateral (a first side) surface, a third lateral (a second side) surface, and a fourth lateral (bottom) surface;

wherein the first, second and third lateral surfaces (42, 43, 44) of the rectangular-shaped mesa are surrounded by the n-doped burying layer (19), and the fourth lateral surface (41) by the thin-n-doped layer (17);

wherein the thin n-doped layer (17) separating the p-doped confinement layer (16) and the ribbon (4) so that there is no migration of p dopant toward the active layer. (Emphasis Added).

In contrast, the Scifres et al. reference discloses a traditional mesa laser with multiple cladding layers (14 and 15), multiple confinement layers (16 and 20) and a mesa formed on a substrate. (See Fig. 1). First, there is a structural difference in the formation of mesa between Scifres and Applicant's invention. In Col. 2, beginning on line 54, Scifres et al. state that [t]he mesa 13 is formed on the surface of the substrate 12 by preferential etching. (Emphasis

Added). Claim 1 recites in pertinent part a step of “locally etching said active layer, said thin n-doped layer and said p-doped confinement layer to form a mesa (11)”. Second, the sequence in the process layers between the Scifres et al. and Applicant’s invention is different. As shown in Fig. 1 in Scifres et al., the process layers starts with a substrate 25, a mesa 13, a first cladding layer 14, a first confinement layer 16, an active layer 18, a second confinement layer 20, and a second cladding layer 22. Claim 1 recites the sequence, in part, as follows: “providing a III-V material (3-1); (b) forming a p-doped confinement layer (16) overlaying the III-V material substrate; (c) forming a thin n-doped layer (17) overlaying said p-doped confinement layer; (d) grown a active layer (4) overlaying said p-doped confinement layer; (e) forming a thin n-doped layer overlaying the active layer”. Third, the design shape of the mesa is different after etching. In Fig. 1 of Scifres et al, the mesa 13 is shown in a trapezoid structure. (Emphasis Added). Claim 1 recites in pertinent part, locally etching said active layer, said thin n-doped layer and said p-doped confinement layer to form a rectangular-shaped mesa. Fourth, the placement and purpose of a confinement layer are different. Scifres et al. state that the improvement comprises at least one radiation confining layer provided between the active layer and one of the cladding layers generally continuous with the active layer. (Col. 2, lines 9-12). Claim 1 recites in pertinent part that “the thin n-doped layer (17) separating the p-doped confinement layer (16) and the ribbon (4) so that there is no migration of p dopant toward the active layer”. (Emphasis Added). It is respectfully submit that Claim 1, now amended, is patentable over the cited reference of Scifres et al.

Claims 2 and 4-8 depend on Claim 1 and are patentable over cited reference of Scifres et al. for at least the same reasons as described for Claim 1. Claim 3 has been cancelled.

Claim 8 is an independent apparatus claim that includes similar limitations as method Claim 1 and recites a structure, comprising:

a III-V substrate (3-1);

a non-doped buffer layer overlaying the III-V substrate (3-2);

a p-doped contact layer (15) overlaying the non-doped buffer layer;  
a p-doped confinement layer (16) overlaying the p-doped contact layer;  
a thin n-doped layer (17) overlaying the p-doped confinement layer;  
an active layer (4) overlaying the thin n-doped layer;

a thin layer of non-doped layer (18) overlaying the active layer; wherein a rectangular-shaped mesa is formed by etching the thin n-doped layer, the active layer, and the thin layer of non-doped layer, the rectangular-shaped mesa having a first lateral (top) surface, a second lateral (a first side) surface, a third lateral (a second side) surface, and a fourth lateral (bottom) surface, the thin n-doped layer separating the p-doped confinement layer and the active layer so that there is no migration of p dopant toward the active layer, the etched portion of the active layer being referred as a ribbon; and

an n-doped burying layer surrounding the first, second and third lateral surfaces (42, 43, 44), and the fourth lateral surface (41) by the thin-n-doped layer (17). (Emphasis Added).

The reasoning and arguments presented above with respect to Claim 1 are also applicable to Claim 8.

Claims 10-13 depend on Claim 8 and are patentable over the cited reference of Scifres et al. for at least the same reasons as described for Claim 8.

Conclusion

Claims 1-2, 4-8 and 10-13 are pending in this application. In view of the amendments to the claims and the above remarks, Applicant respectfully requests allowance of these pending claims. If the Examiner's action is other than allowance, the Examiner is invited to telephone Applicant's attorney at the number noted below.

Respectfully submitted,

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Date



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Peter C. Su

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Date